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(71) Applicant and

(72) Inventor: **SAVIRANTA, Tapio** [FI/FI]; Luutnantintie 10  
E 62, FIN-00410 Helsinki (FI).

(74) Agent: **PATENT AGENCY COMPATENT LTD.**;  
Pitkäsillanranta 3 B, FIN-00530 Helsinki (FI).

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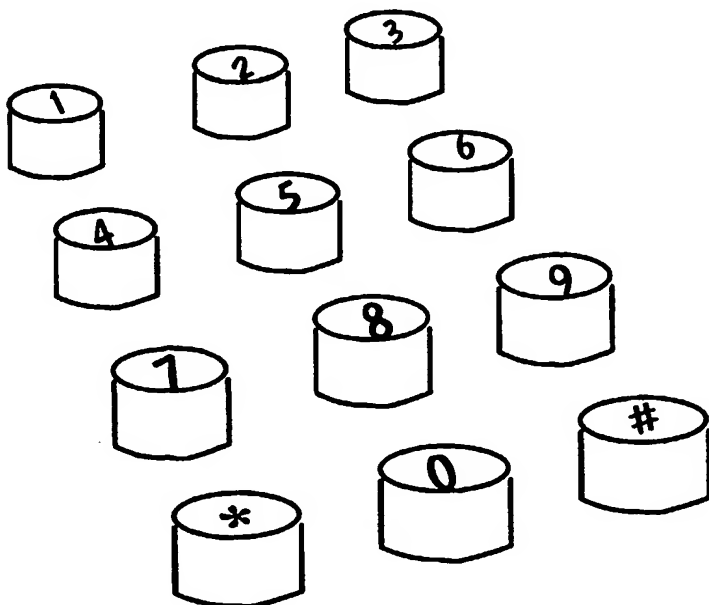
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(54) Title: A QUICK-OPERATED SMALL-SIZED KEYPAD



(57) Abstract: A numeric keypad whose keys 0-9 are replaced with, for example, keys that are joysticks, so that each key/joystick is adapted to move to at least two movement directions, wherein each movement direction results in a different character. Each key has just one edge through which the key is moveable to its movement directions. Because a key has one edge and the surface of the said edge is smaller than the corresponding surface of any known multi-direction key, the keys of the keypad can be located close to each other. Therefore the keypad is small-sized. Also a computer keyboard can be composed of joysticks or another type of multi-direction keys that have one edge for entering letters and other characters.

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## Quick-operated small-sized keypad

### Field of the invention

The present invention concerns a keypad which is small-sized and  
5 with which it is possible to write text more quickly than with a conventional keypad composed of push-buttons. The text may include letters A-Z or characters belonging to another alphabet or character set.

### Background of the invention

10 The keyboards of the computer include the characters A-Z and a set of other characters. Each letter A-Z has its own key and the placement of these keys is fixed. The keys are in three lines, so that the first six letters are: 'q', 'w', 'e', 'r', 't', and 'y', from which the keyboard has obtained the name "qwerty".

15 Also some mobile station models contain a qwerty keyboard. Because a qwerty keyboard requires 26 keys, the mobile station models include at least 26 keys. Usually, a qwerty keyboard also includes a numeric keypad containing the keys 0-9. An aim with mobile terminals is to make them small-sized and light in weight. However, a qwerty keyboard must be large enough  
20 that it can be operated easily.

In addition to the qwerty keyboard, another known fixed keyboard is a numeric keypad including ten keys, which is used especially in telephone terminals. A key intended for entering the number 1 could be termed the 1-key, a key intended for entering number 2 could be termed the 2-key, etc. In  
25 a numeric keypad 0-4 letters are positioned in one key, so that the 0- and 1-keys contain no letters, the 7- and 9-keys have four letters, and the rest of keys contain three.

FIG. 1 shows a known keypad that is used so that a letter is entered by pressing a certain key on to four times. For example the letters A, B,  
30 and C are placed with the 2-key 11. Letter A is entered by pressing the 2-key once, letter B is entered by pressing 2-key twice, and letter C is entered by pressing 2-key three times. The other keys of the keypad are operated in the same way.

The usability of a known keyboard suffers from the following drawbacks.  
35

First, the selection of the letter S or Z requires four sequential key pressings. The selection of eight other letters requires three sequential key pressings. Therefore the selection of certain letters takes quite a long time, because sequential key pressings are needed at least three times. This appreciably delays the typing of short messages, for example. Changing the letter size from big to small case, or vice versa, requires one additional key pressing of another key.

Secondly, when typing the same letter twice, the time period between the first and the second key pressing should be long enough. For example, when typing two A-letters the 2-key should be pressed and then a pause, after which the 2-key should be pressed again. If the said pause is too short, the key pressings result in one B-letter, not two A-letters. Thus, the pause should be long enough to obtain the letters needed. However, the pauses between key pressings delay writing, of course.

Thirdly, the known keypad is suitable for the use of a relatively small character set. In English-speaking countries the character set contains the letters A-Z, numbers 0-9, and certain punctuation marks, such as the period, the question mark, and exclamation mark. In certain languages an alphabet contains more letters than A-Z. In addition, in certain languages one character corresponds to a syllable. These languages, such as Korean, are termed a syllabic language. In certain languages, one character corresponds to a word. For example, in Chinese, the language spoken by the majority of people in the world, one character corresponds to one word.

A computer mouse is used by moving a cursor on the screen pressing a mouse button once (click) or twice (double-clicking). In no application is a mouse button pressed three times ("triple-clicking"). For physiological reasons it is easier for a human being to distinguish between single clicking and double-clicking than between double-clicking and "triple-clicking".

The elimination of the drawbacks of the prior art has been sought by means of a typing logic.

A patent document EP0608682 describes certain logic with whereby a letter group is first defined and then a letter's placement in the letter group. For example, when using a keypad shown in as FIG. 1 letter A is entered as follows. First the 2-key 11 is pressed, because letter A is placed in a letter group {A, B, C}. Then 1-key 12 is pressed, because A is the first letter in the letter group. Letter B is entered by tapping the 2-key twice, because

letter B is the second letter in the letter group. Correspondingly, each letter of A-Z can be entered by two key pressings.

The prior art also contains solutions whereby conventional keys are replaced with keys having at least two positions for entering letters. With this method a key can be moved in a first direction resulting in a first letter. In addition, the key can be moved in a second direction resulting in a second letter, and so on.

FIG. 2A shows a key of a keypad described in patent document WO99/37025. The said key is oval and can be moved to the left and to the right. The key has a primary mode and a secondary mode; the mode is selected by pressing a mode key. In the primary mode, for example, number 7 when a key 201 is pressed. In the secondary mode the key 201 results in letter A when the left edge 202 of the key is pressed, and the key 201 results in letter B when the right edge 203 of the key is pressed.

FIG. 2B shows another key described in patent document WO99/37025. The said key 204 is square having four corners/edges. In the secondary mode the key results in four various letters depending on which corner 205, 206, 207, or 208 is pressed.

FIG. 2C shows two keys of a certain keypad described in patent document WO99/37025. Those keys are triangular. When comparing keys 209 and 210 to keys 11 and 12 we can say that the first-mentioned keys 209 and 210 are larger, because both of them should result in three various letters depending on which corner 211, 212, or 213 a user presses. In addition, the keys 209 and 210 should be quite far from each other in order to eliminate typing errors. For example, when a user presses the corner 212, key 210 should be far enough from the key 209 to avoid pressing the key 209 simultaneously.

Thus, a conventional key has only one position, i.e. "inward", for entering various keys. A key having at least two positions for entering various letters is termed a multi-position key. The invention is closely related to multi-position keys.

The prior art multi-position keys have their own drawbacks.

The first drawback is that the use area for a multi-position key is larger than the use area for a push-button key, wherein the use area of a key is the surface which is intended for pressing that key or which is difficult to avoid touching when pressing the key. If a key includes edges/corners, such

as the corners 211, 212, and 213 of the key 210, the use area contains the entire area between the said edges/corners.

5 The second drawback of the prior art is that the multi-position keys cannot be located close to each other, because they need a relatively large safe area to avoid typing errors. The safe area of a key is the use area of the key plus some extra spaces surrounding the edges/corners. For example, key 210 has a safe area 214. Of course, the size of a user's finger affects the size of a safe area.

10 Because the prior art multi-position keys require a relatively large use area and safe area, the keypads composed of multi-position keys is relatively large.

### **Summary of the invention**

15 The objective of the invention is to define a keypad, a qwerty keyboard, or some other keypad/keyboard, so that it is small-sized and quick to operate.

The keys of a keypad in accordance with the invention have at least two directions for entering characters, i.e. the keys are adapted to move in at least two directions.

20 A key of the keypad has one edge through which the key is moved various directions. The term "protrusion" refers to an edge, a corner, a top, a border, or an extension of a key. Because a key has only one protrusion, the use area of the key is smaller than the use area of the prior art multi-position key. Actually, the use area of the key is even smaller than the use area of a conventional key.

25 The protrusion of a key may be relatively short and thus the trajectories of the key are also short. Therefore the safe areas of keys are small and the keypad composed of the keys is small-sized.

30 One embodiment of the invention is a numeric keypad in which each key is a joystick having at least two directions, so that moving a joystick in a first direction results in a first character and moving the joystick in a second direction results in a second character.

### **Brief description of the drawings**

35 The invention is described more closely with reference to the accompanying drawings, in which

- Figure 1 shows a known numeric keypad in which a character is determined by number of key pressings,
- Figure 2A shows a first known key,
- 5 Figure 2B shows a second known key,
- Figure 2C shows two keys of a known keypad,
- Figure 3 shows two belonoid keys of an inventive keypad,
- Figure 4 shows a numeric keypad in which each key is a joystick,
- Figure 5A shows the use of a 2-key when entering the letters A, B, C, and
- 10 characters '@', '<', '>', '(', ')', '{', '}', '[', and ']',
- Figure 5B shows the use of a 2-key when entering the letters a, A, b, B, c, C, 2 and a national special letter,
- Figure 6A shows a slide switch type of key in its basic position,
- Figure 6B shows a first entering position,
- 15 Figure 6C shows a second entering position,
- Figure 7 shows a numeric keypad located in a mobile terminal.

### **Detailed description of the invention**

The keypad/keyboard in accordance with the invention is intended

20 for typing text. The text may be composed of letters, syllables, words, or any characters of any language, including spoken languages and computing languages. Inventive keypads/keyboards include elements which are known as such, but which are used in a new way.

The entering of text can be considered from the standpoint of set

25 theory. A text is composed of a limited amount of characters differing from each other. These characters compose a character set. Entering text in accordance with the invention involves a character set that is divided into at least two subsets, so that at least one subset contains at least two characters.

30 In the known keypad the character set composed of letters A-Z is divided into following the subsets: {A, B, C}, {D, E, F}, {G, H, I}, {J, K, L}, {M, N, O}, {P, Q, R, S}, {T, U, V}, and {W, X, Y, Z}, wherein the letters of the subset {A, B, C} are entered by the 2-key and the letters of the subset {D, E, F} are entered by the 3-key etc. Of course, any other way of dividing letters

35 into subsets is possible.

A key of a keypad preferably has one "middle" position and four "non-middle" positions. These "non-middle" positions could be "upward", "downward", "to the left", and "to the right". Then letter A can be entered by moving the 2-key from the middle to the left. The middle position is an example of a position that is termed "the basic position". The use of a key is fluent if the key is adapted to return to its basic position when the key is not touched.

FIG. 3 shows two belonoid keys 31 and 32 of an inventive keypad. The use area of the keys is small, for example, the use area 33 of key 32 is small. Therefore only one character is located in key 32, i.e. number 2. The other characters A, B, and C, which are entered by using the 2-key, are located in the cover of the keypad 34. Because the belonoid keys 31 and 32 are short, their trajectories towards each other are also short and thus the keys can be located close to one another. When comparing the safe area 35 of the key 32 with the safe area 214 of key 214, we can say that the safe area 35 is the smaller one.

The main teaching of the invention is that a key of a keypad should have just one protrusion for entering letters and other characters. The prior art multi-position keys have several protrusions for entering letters.

Alcatel uses a joystick selector in a Mobile 100 telephone set, but not in the numeric keypad of the telephone set. In a Mobile 100 telephone set the joystick selector is intended for using the menu system of the telephone set. Therefore a joystick is not a new element in a telephone set, but it is a new element in a keypad intended for typing text.

FIG. 4 shows a numeric keypad of which each key is a joystick. Joysticks can be tiny and still usable: the width of a joystick may be about 4 mm and the height of the key may be 3 mm, as in a Mobile 100 telephone set.

FIG. 5A shows a 2-key having four different positions. The 2-key 51 is used so that letter A is entered by moving the key 51 from the middle to the left. Correspondingly, letter B is entered by moving the key 51 from the middle upwards, and letter C is entered by moving the key from the middle to the right. The fourth position of the key is from the middle downwards. The fourth position may result in a character '@'. FIG. 5A demonstrates that character '<' results by moving the key 51 twice from the middle to the left. Correspondingly, characters '>', '(', and ')' result by moving the key twice in

the directions shown in figure 5A. If required, key 51 can be adapted to result in characters '{', '}', '[', and ']' when the key is moved three times to the directions shown in FIG. 5A.

FIG. 5B shows a 2-key having four different positions, so that  
5 some of the positions result in different characters than in FIG. 5A. A small a is entered by moving key 51 once from the middle to the left, and a big A is entered by moving key 51 twice from the middle to the left. A small b is entered by moving the key once from the middle upwards, and a big B is entered by moving the key twice from the middle upwards. A small c is entered  
10 by moving the key once from the middle to the right, and a big C is entered by moving the key twice from the middle to the right. A small national special can be entered by moving the key once from the middle downwards, and the big national character can be entered by moving the key twice from the middle to downward.

15 As can be seen in FIG. 5B and 5A, one key may result in 8-12 different characters. The above-mentioned joystick used by Alcatel includes also a fifth position. In more detail, the said joystick can be pushed inward in respect of the level of the joysticks on a keypad.

If a key can be pushed once inward in respect to the level of the  
20 keys on a keypad, we can multiply the number of characters obtainable from the key by two. If a key can be pushed twice inward in respect to the level composed by the keys of a keypad, we can multiply the number of characters obtainable from the key by four, etc. The said feature is profitable when writing text that includes hundreds or thousands of different characters, such as  
25 Korean or Chinese text.

Of course, a key may have fewer than four positions, or a key may have more than four positions.

A key can also be in the shape of a pyramid, so that the top/edge of the pyramid is the protrusion intended for entering letters: or a key can be  
30 a ball which is partly located inside the cover of the keypad. Besides these shapes of keys, there are many alternative shapes that can be applied when designing a keypad in accordance with the invention.

In the previous figures, keys are such that they can be tilted from their basic position to some of their entering positions, i.e. their trajectories  
35 are similar to or the same as the trajectories of a joystick. A key on a keypad can be implemented so that, instead of tilting, the key can be slid in at least



two directions, so that the protrusion of the key is perpendicular in respect to the keys of a keypad in all entering positions of the key.

FIG. 6A shows a slide switch key in its basic position. In addition to the said key 61, the figure includes the cover of a keypad 62, and inside  
5 the said cover, a movement space 63 for the key. At both ends of the movement space are attached springs 64 and 65 or corresponding means which return the key to its basic position.

FIG. 6B shows a slide switch key in its first entering position. Key 61 is slid from its basic position to the left, so that pole 66 attached to the key  
10 touches pole 67 attached to the left end of the movement space 63. This causes an electric circuit resulting in a certain character.

FIG. 6C shows a slide switch key in its second entering position. The key 61 is slid from its basic position to the right, so that another pole 68 attached to the key touches pole 69 attached to the right end of the movement space 63. This causes another electric circuit resulting in a certain other  
15 character.

FIG. 7 shows a numeric keypad attached to a mobile terminal.

Besides a mobile terminal an inventive keypad can be attached to different types of electronic equipment that have a screen for showing the  
20 characters entered.

Besides a numeric keypad, the teachings of the invention can be applied when designing a qwerty keyboard or some other keypad/keyboard that is connected to a computer or another electronic equipment.

### Claims

1. A method for entering characters of a language by using a keyboard which includes at least two keys, wherein a key of the keyboard is adapted to move in at least two positions so that

5               when moving the key once in a first position, a first character results and

                  when moving the key once in a second position, a second character results,

                  c h a r a c t e r i z e d   in that the key includes just one protrusion by  
10   which the key is movable in the first position and in the second position.

2. The method as defined in claim 1, c h a r a c t e r i z e d   in that when moving the key twice in the first position another character results than the character resulting when moving the key once in the first position.

3. The method as defined in claim 1, c h a r a c t e r i z e d   in that  
15   the key has a basic position to which the key is adapted to return from the first and second positions.

4. The method as defined in claim 3, c h a r a c t e r i z e d   in that the first position results by tilting the protrusion of the key from the basic position to the first position and the second position results by tilting the protrusion of the key from the basic position to the second position.  
20

5. The method as defined in claim 1, c h a r a c t e r i z e d   in that the key operates as a joystick.

6. The method as defined in claim 3, c h a r a c t e r i z e d   in that the first position results by sliding the protrusion of the key from the basic position to the first position and the second position results by sliding the protrusion of the key from the basic position to the second position, so that the protrusion of the key is all the time essentially perpendicular in respect to the keys of the keypad.  
25

7. The method as defined in claim 1, c h a r a c t e r i z e d   in that  
30   the key operates as a slide switch.

8. A keyboard for entering characters belonging to a language, the keyboard to include at least two keys, and a key of the keyboard being adapted to move at least two position so that

5           when moving the key once in a first position, a first character results and

          when moving the key once in a second position, a second character results,

          characterized in that the key includes just one protrusion  
10 through which the key is movable in the first position and in the second position.

9. The keyboard as defined in claim 8, characterized in that when moving the key twice in the first position another character results than when moving the key once in the first position.

15           10. The keyboard as defined in claim 8, characterized in that the key has a basic position to which the key is adapted to return from the first and second positions.

          11. The keyboard as defined in claim 10, characterized in that the first position results by tilting the protrusion of the key from the basic  
20 position to the first position and the second position results by tilting the protrusion of the key from the basic position to the second position.

          12. The keyboard as defined in claim 8, characterized in that the key operates as a joystick.

          13. The keyboard as defined in claim 10, characterized in  
25 that the first position results by sliding the protrusion of the key from the basic position to the first position and the second position results by sliding the protrusion of the key from the basic position to the second position, so that the protrusion of the key is all the time essentially perpendicular in respect to the keys of the keypad.

30           14. The keyboard as defined in claim 8, characterized in that the key operates as a slide switch.

          15. The keyboard as defined in claim 8, characterized in that the keyboard is located in a mobile terminal.

          16. The keyboard as defined in claim 8, characterized in that  
35 the keyboard is connected to electronic equipment.

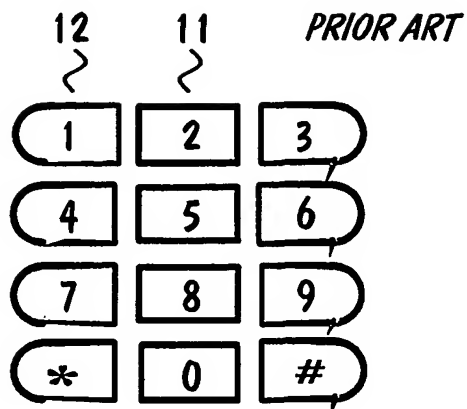


FIG. 1

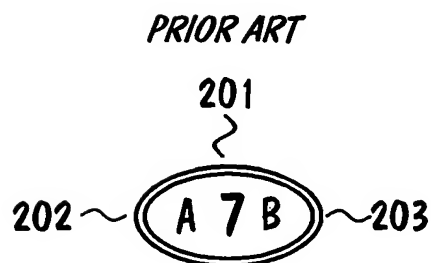


FIG. 2A

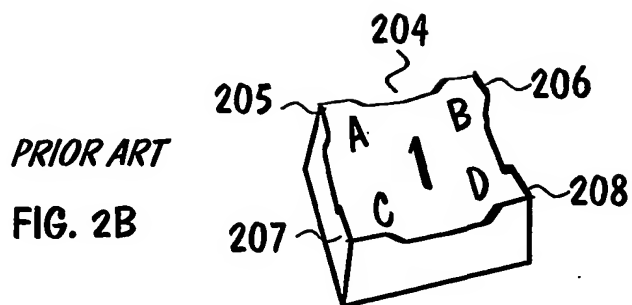


FIG. 2B

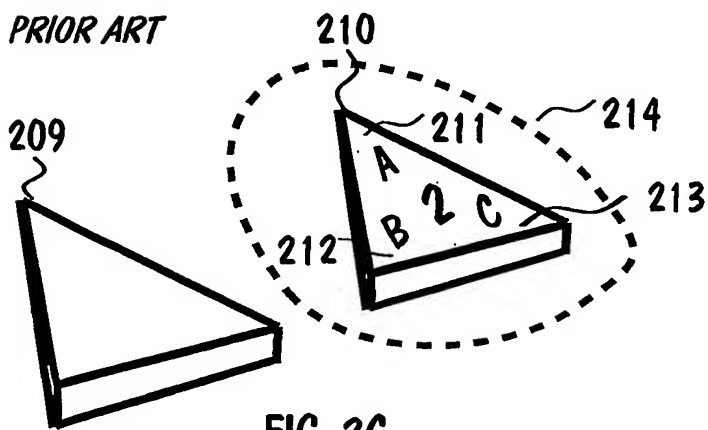


FIG. 2C

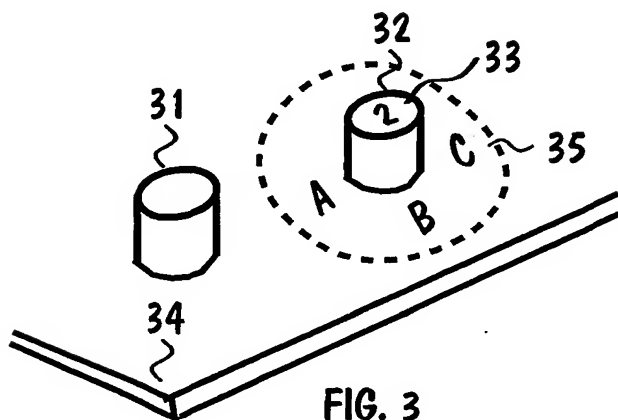


FIG. 3

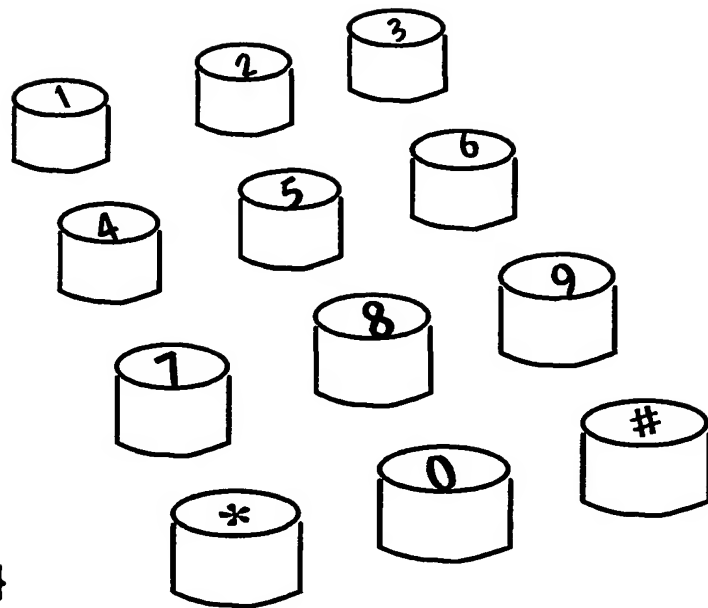


FIG. 4

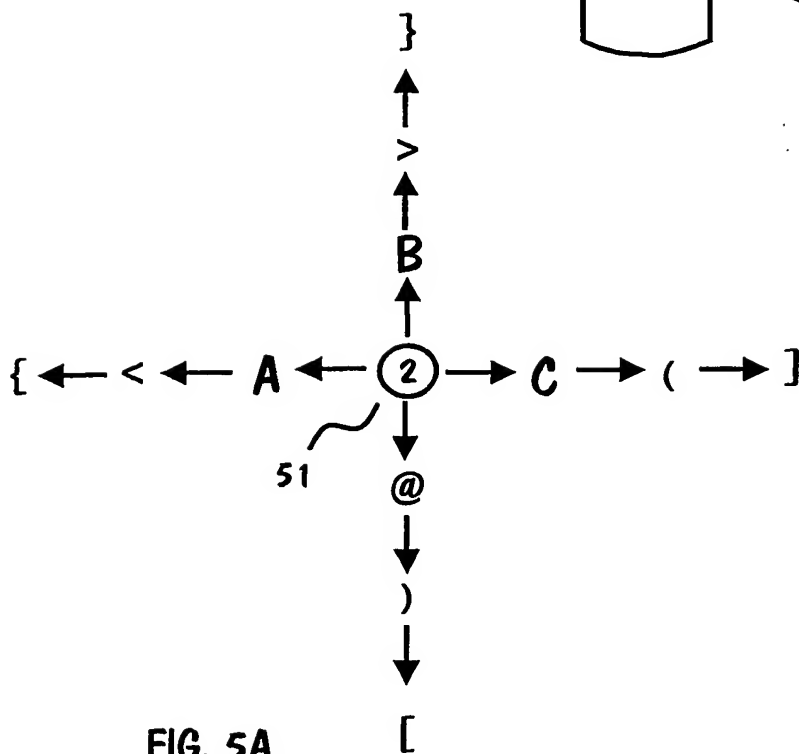


FIG. 5A

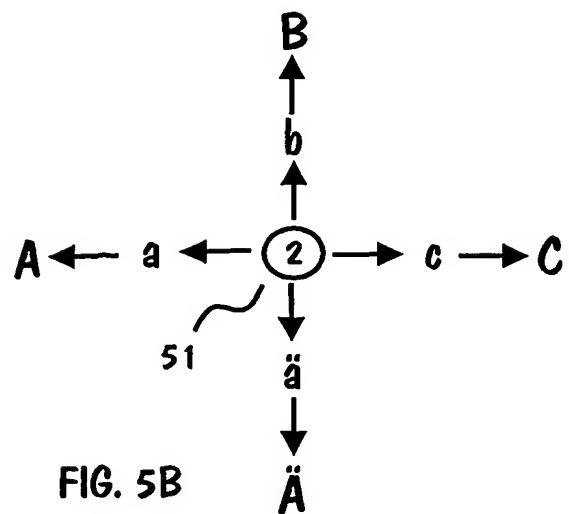
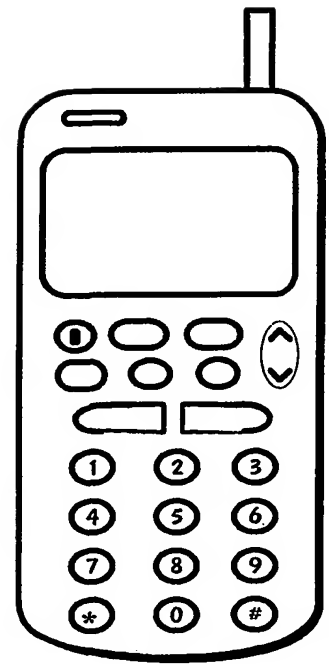
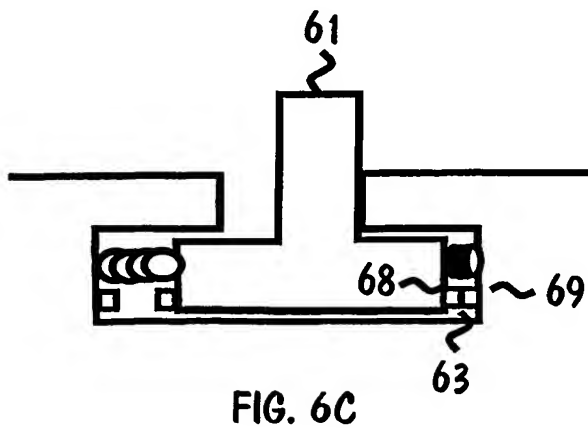
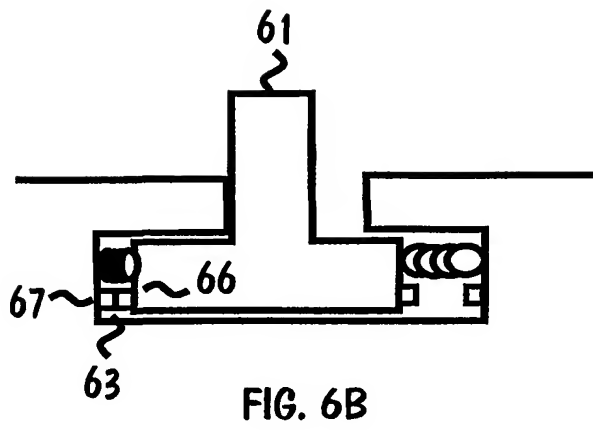
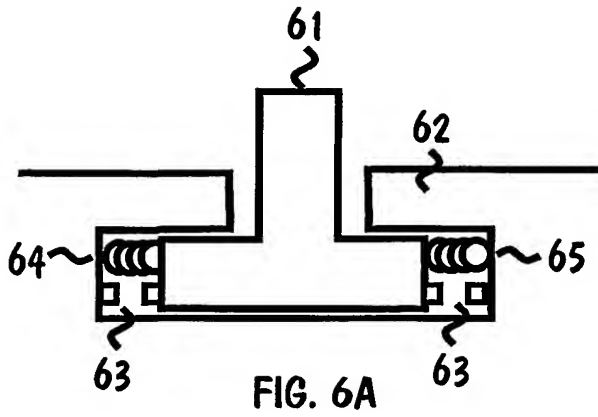


FIG. 5B



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 02/0092

## A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 20010306 U1 (DECKER, HELMUT), 26 October 2000 (26.10.00), page 6, line 10 - page 7, line 30, figures 1,2 --	1-5,8-12,15, 16
X	US 5186555 A (UERU CHIBA), 16 February 1993 (16.02.93), column 2, line 45 - column 5, line 2, figures 1-7 --	1-3,6,7, 8-10,13-16
X	US 4905007 A (SAMSON ROHM), 27 February 1990 (27.02.90), column 5, line 7 - line 23, figures 8-11 --	1-3,6,7, 8-10,13-16

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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# INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 02/092

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 29602988 U1 (SCHULZE, MARTIN), 30 May 1996 (30.05.96), page 2, line 3 - line 30, figures 1,2  -- -----	1-5,8-12,15, 16



# INTERNATIONAL SEARCH REPORT

Information on patent family members

10/06/02

International application No.

PCT/FI 02/0092

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
DE	20010306	U1	26/10/00	NONE	
US	5186555	A	16/02/93	NONE	
US	4905007	A	27/02/90	WO 9111764 A	08/08/91
DE	29602988	U1	30/05/96	NONE	